CLAIMS:

1. A semiconductor storage device comprising:

a first conductivity type semiconductor substrate (1, 111), a first conductivity type well region provided in a semiconductor substrate, or a first conductivity type semiconductor film disposed on an insulator;

a gate insulating film (12, 114) formed on the first conductivity type semiconductor substrate (11, 111), the first conductivity type well region provided in the semiconductor substrate, or the first conductivity type semiconductor film disposed on the insulator;

a single gate electrode (13, 117) formed on the gate insulating film (12, 114);

two charge holding portions (61, 62, 161, 162, 162a) formed on sides of side walls of the single gate electrode (13, 117);

a channel region disposed under the single gate electrode (13, 117); and

second conductivity type diffusion layer regions (17, 18, 112, 113) disposed on both sides of the channel region, wherein

the charge holding portions (61, 62, 161, 162, 162a) are structured so as to change a current amount flowing between one of the second conductivity type diffusion layer regions (17, 18, 112, 113) and the other of

the second conductivity type diffusion layer regions (17, 18, 112, 113) when voltage is applied to the gate electrode (13, 117) by an amount of electric charges stored in the charge holding portions, wherein

a reference voltage is applied to the other of the second conductivity type diffusion layer regions (17, 18, 112, 113),

a first voltage is applied to the one of the second conductivity type diffusion layer regions (17, 18, 112, 113), and

a second voltage is applied to the gate electrode (13, 117) such that carriers are injected into the charge holding portion (61, 62, 161, 162, 162a) existing on the side of the one of the second conductivity type diffusion layer regions.

2. The semiconductor storage device as defined in Claim 1, wherein

the first voltage is applied to the first conductivity type semiconductor substrate (11, 111), the first conductivity type well region provided in the semiconductor substrate, or the first conductivity type semiconductor film disposed on the insulator.

3. The semiconductor storage device as defined in Claim 1 or 2, wherein

the first conductivity type is P type,

the second conductivity type is N type,

the carriers are positive holes,

the first voltage is higher than the reference voltage, and

the second voltage is lower than the reference voltage.

4. The semiconductor storage device as defined in Claim 1 or 2, wherein

the first conductivity type is N type,

the second conductivity type is P type,

the carriers are electrons,

the first voltage is lower than the reference voltage, and

the second voltage is higher than the reference voltage.

5. The semiconductor storage device as defined in Claim 1, wherein

the second conductivity type diffusion layer regions (17, 18, 112, 113) have an offset structure without an overlap region overlapping the gate electrode (13, 117) with interposition of the gate insulating film (12, 114).

6. The semiconductor storage device as defined in Claim 2, wherein

an absolute value of voltage difference between the other of the second conductivity type diffusion layer

regions (17, 18, 112, 113), and, the first conductivity type semiconductor substrate (11, 111), the first conductivity type well region provided in the semiconductor substrate or the first conductivity type semiconductor film disposed on the insulator is 0.7V or more and 1V or less.

7. The semiconductor storage device as defined in Claim 2, wherein

a gate length of the gate electrode (13, 117) is 0.015 μm or more and 0.5 μm or less.

8. The semiconductor storage device as defined in Claim 1, wherein

the charge holding portion (61, 62, 161, 162, 162a) is composed of a first insulator, a second insulator, and a third insulator,

the charge holding portion (61, 62, 161, 162, 162a) has a structure in which a film (15, 142, 142a) composed of the first insulator having a function of storing electric charges is interposed between the second insulator and the third insulator,

the first insulator is silicon nitride, and

the second and third insulators are silicon oxide.

9. The semiconductor storage device as defined in Claim 8, wherein

a thickness of the film (141) composed of the second insulator on the channel region is smaller than a thickness of the gate insulating film (114) and is 0.8 nm or more.

10. The semiconductor storage device as defined in Claim 8, wherein

a thickness of the film (141) composed of the second insulator on the channel region is larger than a thickness of the gate insulating film (114) and is 20 nm or less.

11. The semiconductor storage device as defined in Claim 8, wherein

the film (142, 142a) composed of the first insulator having a function of storing electric charges includes a portion (181) having a surface that is approximately parallel to a surface of the gate insulating film (114).

12. The semiconductor storage device as defined in Claim 11, wherein

the film (142, 142a) composed of the first insulator having a function of storing electric charges includes a portion (182) extending in direction approximately parallel to a lateral side of the gate electrode (117).

13. The semiconductor storage device as defined in Claim 1, wherein

at least part of the charge holding portion (61, 62, 161, 162, 162a) is formed so as to overlap part of the second conductivity type diffusion layer region (17, 18, 112, 113).